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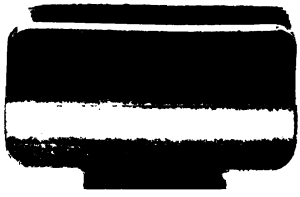

A HISTORY

OF

THE OYSTER

AND

THE OYSTER FISHERIES.

BY

T. C. EYTON, F.L.S., F.Z.S.,
ETC. ETC.

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PREFACE.

In presenting the following remarks to the public, I by no means intend to affirm that more information on many points may not be obtained than is contained in the present work: as far as these go, they are generally the results of my own observations on the coasts of England, Ireland, Scotland, Isle of Man, and Wales; I wish I could also say, that I had had more experience on the Channel beds. I have also received information from numerous friends regarding other localities, verifying, or otherwise, my own observations. The Chapter on Reproduction is entirely from my own observations, obtained with

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much trouble and some cost. The last, consisting of suggestions, may be regarded as a sort of summary, or an attempt to adapt what I have learnt of the habits and natural history of the Oyster to the British Fisheries, thereby showing the manner in which their productiveness may be increased.

T. C. EYTON.

Eyton, Wellington, Shropshire,
July 16, 1858.

CONTENTS

CHAPTER I.

Page

History and Antiquity of the Oyster as an article of food.. 1

CHAPTER II.

Laws relating to Oyster Fisheries 7

CHAPTER III.

Natural History and Anatomy of the Oyster..... 12

CHAPTER IV.

Reproduction and Growth 17

CHAPTER V.

Enemies of the Oyster 28

CHAPTER VI.

List, and Account, of the principal Oyster-beds 30

CHAPTER VII.

Suggestions for the Formation of new Oyster-beds and the Preservation of old ones 33

APPENDIX 37

LIST OF ILLUSTRATIONS.

PLATE I. Large Oyster from Llandudno, opened on the upper shell, and showing the mantle, C, the adductor muscle, A, the edges of the bronchiæ, D, and the ovaries, B B.

PLATE II. Dissection of an Oyster: A, ovaries; B, the situation of the mouth; C, the labial palpi; D, D, D, liver; E, the stomach; F, the heart; G, the intestinal canal; H, the vent.

PLATE III. Fig. 1. Dissection of an Oyster, showing the principal nerves—A, that communicating with the adductor muscle; B, that communicating with the mouth.

Fig. 2. Outline of a Cockle-shell, showing the siphons, B, and the foot, A.

PLATE IV. Figs. 1 & 2. Spawn from the ovary.

Fig. 3. Spawn from between the folds of the beard. Some of the spawn is of the same form before it is exuded.

Fig. 4. Spat on the Oyster after it has been detached from the parent and adhered to some foreign substance.

PLATE V. Fig. 1. Oyster opened to show the spawn, B, between the folds of the mantle.

Fig. 2. The hinge and ligament in a large Oyster.

PLATE VI. Oysters from one year old to five.

HISTORY OF THE OYSTER.

CHAPTER I.

HISTORY AND ANTIQUITY OF THE OYSTER AS AN ARTICLE OF FOOD.

THAT the Oyster has been used by man, not only as an article of necessary food, but as one of luxury, from great antiquity, appears by the following quotations. Pliny, who died in the year 29, says of oysters:—"Nec potest videri satis dictum esse de his, cum palmas mensarum divitum attribuantur illis."

Juvenal would appear to have had a delicate palate, and to have been as experienced in the taste of oysters as the fishmongers of the present day:—

> ——— "Circæis nata forent, an
> Lucrinum ad saxum, Rutupinove edita fundo
> Ostrea, callebat primo deprendere morsu."

The above quotation shows that the British oyster, even at the early period when Juvenal wrote, about

A.D. 60, was in high repute among the luxurious Romans.

Dr. Baster, as quoted by Dr. Johnston, appears to have been of opinion that the Roman predilection for oysters was a sanitary one. "Living oysters," he says, "are endowed with the proper medicinal virtues; they nourish wonderfully, and solicit rest; for he who sups on oysters is wont on that night to sleep placidly; and to the valetudinary afflicted with a weak stomach oppressed with phlegm or bile, eight, ten, or twelve raw oysters in a morning, or one hour before dinner, is more healing than any drug or mixture that the apothecary can compound." This mode of acquiring an appetite for dinner appears to be continued to the present time, as it is not by any means uncommon, in a hospitable friend's house, to be asked to take a few oysters before dinner to give you an appetite.

Sallust, B.C. 50, appears to have had a very low estimate of our ancestors, or else a very high one of the oyster, when he says, "The poor Britons—there is some good in them after all—they produce an oyster."

One Sergius Orata is the first person of whom we have an authentic account as a cultivator of oysters; for, says Pliny, he did not make them for the sake of indulging his appetite, but through avarice; and made great profits of them. Orata got great credit for his Lucrine oysters, for the British were not then known.

"The ancients," mentions Pennant, quoting Athenæus, "eat them raw, and sometimes roasted; they had also a custom of stewing them with mallows and docks, or with fish (cod's-head and oyster-sauce), and esteemed them very nourishing."

Among the authors who have written upon the natural history of the Oyster since printing was invented, I believe Gesner is the first. The title-page of his work, liber iv. 'Qui est de Piscium et Aquatilium Animantium Natura,' bears the following letters as a date, CIↃ IↃ CIIII, and was printed at Frankfort; the other volume, 'De Avibus,' is dated 1535. Rondeletius and Belon, both of whom are quoted, bear dates, the former 1558, and the latter 1555, supposing my copies to be the first editions.

Gesner, in his History of the Oyster, 'De (Ostreis, sive) Bivalviis testa duriore contectis, Belonius,' gives the following as the mode in which oysters were treated by the Romans:—"Nam quæ a Brundusio in Lucrinum lacum transferebantur (quum Romana res magnitudinis atque luxuriæ fastigium teneret) ut veluti dulcium aquarum gaudentes adventu pinguescerent, integræ cum testis divendebantur." This practice of the Romans is precisely what is now done on the best-managed beds at the present day. Gesner also states, quoting from Galenus, that they generate healthy humours, and gives an account of those which were supposed to be species in that day.

Aldrovand, in his voluminous work published in 1606, quotes the account of Sergius Orata from Pliny, and also an account of the luxury of Æsop's son in eating oysters. This author's account is altogether indeed very amusing.

Jonston, in his 'Historia Naturalis de Exsanguibus Aquaticis,' published in 1657, gives a wonderful story of the earth having subsided in the time of the war with Mithridates, when lakes and rivers appeared, some fresh and others salt, stocked with oysters and fish. He also gives an account of the manner in which the crab enters the shell of the oyster, by inserting a stone between the valves when open, and devouring the fish at leisure. The Pontifical suppers in ancient Rome appear to have begun with echini, or sea-eggs, and oysters.

Dacosta's work, 'Historia Naturalis Testaceorum Britanniæ,' appears to have furnished matter for most of the modern works on the Oyster. He mentions, quoting from Jacob's 'History of Faversham,' that a company of free dredgers existed there in the time of Henry II. (1154), and that they paid for their right the sum of twenty-three shillings and fourpence annually to the Crown;—that two annual Admiralty or Water Courts were held for the fisheries and of the oyster-trade, which, he says, received generally about £3000 from the Dutch. The same author states, "that from the mouths or entrances of Sandwich Bay

and the adjoining coast, or Richborough and Reculver, oysters are got in great plenty, and are the most delicious that can be taken; but as the beds do not afford native oysters sufficient for the demand, large quantities of small ones, called 'brood,' are annually collected from different parts of the surrounding sea, even from the Land's End in Cornwall, from Scotland, and from France, in order to increase, and be ameliorated of their saltness by the constant flow of fresh water from two great rivers, the Thames and the Medway. It must therefore be admitted that, although oysters are found round all the coast, yet those of the bay of the Roman Rutupiæ, or Richborough, may justly claim the preference of all others."

From Bishop Sprat's account of oysters given in the 'History of the Royal Society,' republished in Latin by Dr. Lister in his 'Hist. An. Angl.,' copied from Dale's 'History of Harwich' by Pennant in his 'British Zoology,' and since by Prof. Forbes, I shall only quote, to show that, probably from the beds having been over-fished since the bishop's time, the oysters now spawn much later than they did formerly. This subject will be referred to again in the course of the work more fully. The bishop states, "that *in the mounth of May* oysters cast their spawn (which the dredgers call spat): it is like to a drop of a candle, and about the bigness of a halfpenny. . . . 'Tis probably

conjectured that the spat in twenty-four hours begins to have a shell. In the mounth of May the dredgers (by law of the Admiralty Court) have liberty to catch all manner of oysters. . . . The reason of the scarcity of oysters, and consequently of their dearness, is that they are bought up by the Dutch."

"The reason why a penalty is set upon any that shall destroy the cultch is, because they fear that if that be taken away the ouse will increase, and then muscles and cockles will breed there and destroy the oysters, they not having whereon to stick their spat. . . . . The male oyster is black-sick, and the female white-sick."

Barbut, in his 'Genera Vermium,' published 1788, states that the oyster is a reputed hermaphrodite, and that the spawn which they cast in May adheres to rocks and other matters at the bottom.

The 'Systema Naturæ' of Linnæus, published 1735, and going through many editions, being merely an arrangement or classification of the Animal Kingdom, does not give us any information.

CHAPTER II.

LAWS RELATING TO OYSTER FISHERIES.

THE earliest Act of Parliament relating to fisheries, that I am aware of, was passed in the third year of the reign of James I. chap. 12. There was also an Act passed in the 13th and 14th years of the reign of Charles II. chap. 28. After this, the next Act relating to fisheries appears to be the 1st of George I. chap. 18; but none of these Acts relate, except in general terms, to oysters.

An Act of Parliament relating to oyster-fisheries appears to have been passed in the 31st year of the reign of George III., chap. 51, which has been repealed by one passed in the 28th year of the reign of George IV., chap. 29, which enacts, "That if any person shall steal any oyster or oyster-brood from any oyster-bed, laying, or fishery, being the property of any other person, and sufficiently marked out or known as such, every such offender shall be deemed guilty of larceny, and being convicted thereof shall be punished accordingly. And if any person shall unlawfully and wilfully use any dredge, or any

net, instrument, or engine whatsoever within the limits of any such oyster-fishery, for the purpose of taking oysters or oyster-brood, although none shall be actually taken, or shall, with any net, instrument, or engine whatsoever, drag upon the ground or soil of any such fishery; every such person shall be deemed guilty of a misdemeanor, and being found guilty shall be punished by fine or imprisonment, or both, as the court shall award, such fine not exceeding the sum of twenty pounds, and such imprisonment not to exceed three calendar months."

A trial took place at the Sussex Lent assizes, 1814, Bridger *v.* Richardson, an action being brought to recover the penalty of £10 under the above statute, for wittingly, with a certain engine called a dredge, taking, in Chichester harbour, three gallons of oyster fry and spat, the same being sea-fish, and that of a size unfit for use. There was also a second count for a similar penalty, for wittingly, with a certain engine called a drag, taking 100 bushels of the brood sea-fish, to wit oysters, the same being sea-fish.

On the trial it was proved that the defendant, who was a Colchester fisherman, took the brood in question for the purpose of carrying them to Colchester, to be laid down there on private lands for further growth and maturity, and to make them marketable.

Defendant's counsel objected, 1st, that the taking must be with the intent to destroy, the contrary of

which was proved; 2ndly, that the Act applied only to floating fish. A verdict was, however, taken for the plaintiff for £10, with liberty to defendant to move for a nonsuit. Accordingly a rule was obtained in the Queen's Bench for that purpose, and, after long arguments on both sides, the court held the case not to fall within the meaning of the statute, for that the taking could not be penal, when the object of such taking was not to destroy, but to preserve.

In 1833 a select committee of the House of Commons, appointed to inquire into the present state of the British Channel fisheries and laws affecting the fishing-trade of England, and to which committee petitions from Emsworth, Brixham, Havant, Langstone, Bedhampton, Farlingdon, Plymouth and Rosham, complaining of distress, were referred, report, in reference to the petitions (see Report, p. 13), that not only in these harbours, but in others, a practice generally prevails, and which appears to be of recent introduction, of persons coming in fishing-smacks to dredge for, and carry away, the young brood of oysters and other shell-fish, to the great damage and destruction of the oyster-beds and the brood of other fish there; and it appearing to your committee that such a practice is also unjust, inasmuch as the oyster-beds in those situations are generally known to have been formed by the labour and industry of the fishermen and inhabitants of the neighbourhood, or their an-

cestors, thus affording to them a beneficial source of employment, upon which they have been accustomed to rely, and in which therefore they ought to be protected.

The committee then go on to report, that, having examined the Acts of Parliament, they do not find any sufficiently stringent to prevent the grievance complained of, and that it should be made unlawful to take or carry away any oysters from such beds of a less size than are fit for food, that is to say, of less size than $2\frac{1}{2}$ inches in width; or to fish for oysters at any time between the first day of May and the last day of August in every year, or such other time as should be fixed in reference to any particular harbour, according to the season in which the oysters there become fit for food; such seasons, and all necessary regulations for those fisheries, being determined or approved by the magistrates of the county or district in which they are situate, and enforced by conservators and officers locally appointed for that purpose.

No Act appears, however, to have been passed, putting these recommendations in force.

In consequence of the French fishermen exercising their calling on the English shore, a convention was entered into in 1839 between Her Majesty and the King of the French, fixing certain boundaries, and to which a chart was appended.

The 27th of Victoria, chap. 79, entitled "An Act to

carry into effect a Convention between Her Majesty and the King of the French, concerning the Fisheries in the Seas between the British Islands and France," which also applies to the whole coast, enacts :—

Sect. 9 empowers officers of the Coast-guard or Customs to seize dredges.

Sect. 45 provides that the oyster-fisheries shall open on the 1st of September, and shall close on the 30th of April.

Sect. 46 prohibits boats from having dredges or other implements for catching oysters on board.

Sect. 47 prohibits dredging between sunset and sunrise.

Sect. 48. Oysters less than 2½ inches in the greatest diameter of the shell to be thrown overboard.

Sect. 49 prohibits ballast being thrown overboard on oyster-beds.

18 & 19 Vic. chap. 101, entitled "An Act for the effectual execution of the Convention," enacts :—

Sect. 1 authorizes officers of the Coast-guard or Customs to seize dredges and oysters found on board fishing-vessels between the 1st of May and the 31st of August.

Sect. 2. Oysters landed between the above dates may be seized.

CHAPTER III.

NATURAL HISTORY AND ANATOMY OF THE OYSTER.

The Oyster belongs to that division of Mollusca called Conchifera, or bivalve shells, having two separate shells joined together by a ligament, and forming a hinge. When the shells are shut, they enclose the animal. The shells are made to shut by means of a very strong adductor muscle (Pl. I. A), attached to both upper and lower valve by the elasticity of the hinge-ligament (Pl. V. fig. 2). Thus, if the adductor be divided by a thin knife introduced between the valves, they immediately open. Oysters are acephalous, or without any distinct head, although they have a mouth (Pl. II. B); but are completely deprived of eyes. In their adult state they are devoid of all locomotion, being found, when undisturbed from their nativity, always attached to other shells, rocks, or other hard substances. It is not, like the Cockle and many other Conchifera, furnished with a foot (Pl. III. fig. 2, A), which enables the latter to travel slowly on a soft bottom; neither has it those curious ap-

pendages called siphons (Pl. III. fig. 2, B), with which the Cockle is also provided.

The mantle (Pl. I. C) is free, and encloses the bronchiæ (Pl. I. D), or breathing apparatus. The Cockle progresses by means of extending its foot forward, and dragging the shell edgeways after it. On the opposite extremity to the foot project two tubes, scarcely beyond the shell; one of these is the entrance to the respiratory organs, the other the vent. The same functions that are carried on by these tubes in the Oyster have considerable modifications. While the bronchiæ in the Cockle are internal, those in the Oyster are external, being situated between the folds of the mantle; and freely admit the access of water when the shell is open.

The mantle, which I have just mentioned (Pl. I. C), is an organ of great importance to the animal, as it is by its means that the shell is enlarged: it lines the edge of the internal surface of both shells, and is furnished with glands, which deposit carbonate of lime with a glutinous secretion when the shell requires increasing on the edge, and also on the internal surface. The edges of these repeated deposits, slightly projecting one over the other, form the ridges and carinations observable in most bivalve shells.

Having now explained, I hope intelligibly, the organs of the Oyster as seen externally, I shall endeavour to point out the internal ones, which can of

course be only observed by dissection. It will be necessary to understand, however, in the first place, what relations two of the organs bear to one another, namely the bronchiæ and mouth. The latter is furnished on each side with two lobes, called the labial palpi (Pl. II. c): the former, in the process of respiration, collects on its delicate surface numerous animalculæ, upon which the animal feeds: these are collected by the palpi, and transferred to the mouth. These palpi also serve another purpose at the time of reproduction.

We will suppose the Oyster to be deprived of its lower shell, as in Plate I.: we observe the adductor muscle (A) severed, the ovaries (B B) extending over the liver and stomach, and the upper lobe of the mantle (C), all visible. Upon turning back the edge of the mantle, we shall discover the four lobes of the bronchiæ (D), and below them, again, the lower folds of the mantle lining the opposite shell. On returning two of the bronchial lobes back, so as again to cover the lower fold of the mantle, we shall find, situated at the end towards the hinge, between the four lobes, the mouth, having a pair of somewhat ovate labial palpi (Pl. II. c), situated one on each side, and extending downwards. We shall also observe, unless the animal is very full of spawn, some dark olive marks appearing through the cuticle of the ovaries: these are the stomach and liver.

On proceeding further, and dissecting away the upper lobe of the mantle, the two upper bronchiæ, and the upper portion of the ovaries carefully, the liver (Pl. II. D D D), stomach (Pl. II. E), intestine (Pl. II. G), and heart (Pl. II. F) become apparent. Some difficulty will be found in dissecting away the ovaries, as they are diffused throughout almost every portion of the interior organs. The convolutions that the intestine makes are apparent, with the vent (Pl. II. H) situated near the right side of the adductor muscle, the liver surrounding the whole of the stomach and the principal portion of the central convolution of the intestine. Immediately above the adductor (Pl. I. A), the heart (Pl. II. F) may be observed, by means of which the blood is forced into the filaments of the bronchiæ, to be impregnated with oxygen.

This organ has a very different mode of action from our own: it consists of two distinct cavities, one auricle and one ventricle. The latter expels the blood from the heart through the body and the gills or bronchiæ, from which organs it is received into the auricle and expelled again into the ventricle, thus completing the circuit of the arteries and veins.

The nervous system in the Oyster is of course low: there being no distinct brain, the principal nervous centre or ganglion is situated on the inner side of the adductor muscle (Pl. III. fig. 1, A), which com-

municates with it, and also with the bronchiæ, mantle, and sides of the mouth (Pl. III. fig. 1, B), where two small ganglia or nervous centres are situated. The accompanying drawing (Pl. III.) will show the course of the principal nerves.

CHAPTER IV.

REPRODUCTION AND GROWTH.

THE opinions of authors as to the mode of reproduction in the Oyster may be divided into three: the first and oldest is that of Ulysses Aldrovand, who, under the head Generation, wrote as follows:—"Ostreorum ortus causa putredo quædam esse videtur." With this quotation I think we may at once dismiss the theory of putridity, from which our old author supposes the oyster to be born, merely mentioning that several others of the old writers were of the same opinion.

That mollusca are produced from ova appears to have been the discovery of an anonymous writer in the Philosophical Magazine, 1603, who states that he saw the young snails issue from their eggs, and that he was afraid to give publicity to his discovery without the testimony of other witnesses. This position, however, namely that mollusca are produced from eggs, is not likely to be disputed in the present day. The form which the young assume before quitting the ovary is a question to which I shall have to refer again; upon this state depends whether the animal is

viviparous, ovoviviparous, or oviparous. The first of these terms refers to animals which bring forth their young alive, derived from two Latin words, *vivus*, alive, and *pario*, to bring forth. The second has the addition of *ovo* to it, from *ovum*, an egg, and applies to animals in which the young are hatched from eggs in the interior of the parent, without having any connexion with a uterus or womb. The third, oviparous, to animals which bring forth eggs which are afterwards hatched. Of the first mode of reproduction we have examples in man and other mammalia; of the second, among infusoria and some other animalcules, numbers of which may be observed in any puddle; and of the third, birds form a good example. All animals are either monœcious or dicœcious: these terms were originally applied by Linnæus to two orders of plants, the former having the male and female organs on the same plant, or being unisexual; the latter having the sexual organs distinct on separate plants, or being bisexual: these terms are now applied also to animals. The first point to be considered is, to which of the first-named divisions the Oyster belongs, viz. viviparous, ovoviviparous, or oviparous. My own observations tend to establish the fact that they are ovoviviparous, in support of which view I shall now give a few extracts from my notebook, referring to numerous examinations of the ovaries previous to the expulsion of the young.

"May 19.—Dissected and examined a large number of oysters sent here (Eyton) from Burnham, through the kindness of Mr. Sweeting, of Cheapside, London. The ovaries of all were slightly distended, and full of spawn of various sizes, as represented in the plate (Pl. IV.), when seen in the microscope under a $\frac{1}{4}$-inch power. In the smallest I could not perceive any motion; but in the larger could distinctly detect the vibratile cilia or feelers, as they would probably be termed by the fishermen, in active motion. The smaller ones were round, with a dark marginal rim (Pl. IV. fig. 1), and some had indistinct lines radiating from the centre towards the margin (Pl. IV. fig. 2): the larger ones (Pl. IV. fig. 3) were similar in shape to those obtained from Loch Ryan on the 10th of July, 1856, and exhibited to the British Association at Cheltenham: the interstices between the bronchiæ and mantle were closely examined, but not a vestige of an ovum was to be seen*. The oysters opened were from $2\frac{1}{2}$ to 3 inches in diameter, and had the smooth shell of 'natives'; those most advanced towards

* The spermatozoa with cilia are, I should suppose, undoubtedly the perfect young; but what are the other rounded bodies? A few having been found with radiating lines, it appears likely that a subdivision takes place in an early stage, probably after fecundation. I did not see any spermatozoa that I could construe into male spermatozoa; but I think it probable that they might be visible in the early part of the year, before the ovary begins to swell much.

spawning had the margins of the bronchiæ and mantle blackish, the others were of the usual colour of oysters in season. I placed some of the spawn freshly taken from the ovary in salt water, made after Gosse's receipt, in a glass-tube; they gradually sank to the bottom, but at first appeared lively.

"May 23.—Received some oysters from Llandudno in Caernarvonshire; they were of very large size, measuring 4½ inches by 5 inches. On placing some of the contents of the ovary on a piece of glass, and mixing a little sea-water with it, a most extraordinary scene presented itself under a ¼-inch power magnifying 500 times. The ova were not nearly so large as those from the Burnham oysters mentioned before; they were of two distinct sizes, and very slightly oval, the larger being about four times the size of the smaller; the smaller were moving about by means of their cilia very actively, while the larger ones were stationary and round, with a slightly darkened margin, as in those from Burnham. The smaller ones came into frequent contact, and adhered to the larger ones, sometimes singly, and at other times in groups; when such was the case, they moved, as if tugging at the larger, and in the apparent effort occasionally let go their hold, and, as it were, sprang from the larger; sometimes a small one would come in contact with a large one without attaching itself. After observing them for about ten minutes, the whole became

quiescent. I placed some more of the contents of the ovary under the microscope; but it was far less lively than the first portion observed, probably in consequence of exposure to the air. I have only observed oysters precisely in this state five or six times, as it is scarcely possible out of a large number, even if obtained from the same locality, to find two in similar stages. I did not either observe the rounded bodies with radiating lines in those last mentioned.

"July 7.—Examined a large number of oysters in a fishmonger's shop in London; they were said to come from Jersey, and had all spawned, the ovaries being flat and flabby. Obtained a small quantity of whitish liquid from the ovary. The ova were very minute, but some in motion; probably more would have been so, but the oysters had evidently been taken some time, and were exposed in a basket to the light in a shop window. These oysters had all the appearance of being what are technically termed sea-oysters, or such as had not been moved, the shell being covered with weed, stones, and other rubbish.

"July 9th.—Examined a large number of oysters at another fishmonger's shop, from Jersey, some of which had spawned; these oysters appeared to have been moved, as they were much cleaner than the last: this may be explained by the Jerseymen taking oysters at the latter end of the season, laying them down in shore, and sending them to the London market during

the illegal months, which I am informed is the case. About three in 1000 had the spawn (Pl. V. B) exuded between the bronchiæ; some of this spawn was placed in a tube bottle with salt water, and lived forty-eight hours, although part of the time in my pocket.

"July 11.—Went on board the fishing-smack 'Iris,' the property of Mr. Laban Sweeting, who accompanied me, dredging in the river Crouch with the light dredges, for the purpose of collecting oysters to lay down for the London market in September. Examined an immense number of oysters of all sizes, but found no small ones in spawn, or presenting the appearance of having spawned. Mr. Sweeting is of opinion that they do not spawn until they are three or four years old; they are considered fit for the London market at four, five, and six years old, according to their growth, which depends upon the feeding. Very few (three) were found which had not parted with their spawn, out of many basketfuls looked over: there was no appearance of white spawn, as it is called, in any. Among the shells were dredged up quantities of old shells, stones, and other substances, completely sprinkled over with spat (Pl. IV. fig. 4), as the spawn is called by the fishermen: the rubbish called 'cultch,' consisting of dead shells, unsizeable oysters, &c., was returned to the river.

"The spat resembles the adult oyster in shape, but is very minute: see Pl. IV. fig. 4, magnified 500 times."

The above extracts will be all that is necessary to introduce here, the remaining notes being merely accounts of adventures, and repetitions of what has been stated above. From them I think that it is perfectly evident that the oyster is ovoviviparous and monœcious. I am aware that it is even now the opinion of some fishermen, as well as of Bishop Sprat, that they are diœcious; but although I have examined hundreds of both those which are, as it is termed, black-sick and white-sick, I have never been able to distinguish any difference in the form of the spawn,—the fact being that the spawn is always white until it quits the ovary, and then becomes black. The cause of the exudation of the white is easily accounted for by the ovary being heavily loaded, and the oyster, when disturbed, closing its shell. I have seen both white and black spawn escape into the same basket, from the same causes. The Burnham dredging also tends strongly to corroborate this opinion, being quite the end of the spawning season, and there being no white spawn observed, although some were black-sick. I have endeavoured to compute the number of young oysters between the bronchiæ of a single old one in the following manner:—having collected them all with a camel-hair brush, and placed them in strong spirits for twenty-four hours, I dried them on blotting-paper —the spirits having removed the glutinous matter, —then weighed a tenth part of a grain, and counted

the number of young in it (2500). The total weight of the whole was 72 gr., which, multiplied by 10, and again by 2500, gives 1,800,000 as the total number of young oysters in one old one. I do not mean to say that this calculation is precisely correct, there probably having been some loss; but, at all events, it is a pretty near approximation.

The growth of the oyster depends very much upon the locality, and some grounds feed much faster than others, particularly where there is an admixture of fresh water. As the animal increases, the functions of the mantle are called into operation for the purpose of adding a fresh layer to the shell. Some have imagined that the age of the oyster can be computed by the rings of growth on the shell; but that such is not the case, a very short examination will suffice to show. The immense oysters that are dredged at Llandudno and other places are from beds that have not been much broken up, and from water where there is often a strong current: no doubt, if dredged, and deposited in a proper situation, the spat, with care, would produce good oysters.

Plate VI. represents the oysters from one year old to five, fig. 1 having been deposited as spat the year before. Oysters are found in almost all countries; but not always of the same species as the British one, *Ostrea edulis*.

The following is a list of the Oysters belonging to the genus *Ostrea*, given in Hanley's 'Illustrated Catalogue of Recent Bivalve Shells':—

Ostrea edulis. British Isles; France.
—— hippopus. Boulogne.
—— adriatica. Adriatic; Black Sea.
—— cochlear. Mediterranean.
—— cristata. Mediterranean.
—— gallina. Atlantic.
—— lingua. Timor.
—— tulipa. Hab. unknown.
—— scabra. America.
—— rostralis. America.
—— parasitica. West Indies.
—— denticulata. China.
—— spathulata. On mangrove trees.
—— virginica. Virginia; Mexico.
—— canadensis. North America.
—— excavata. New Holland.
—— mytiloides. Zebu; Philippines.
—— sinuata. Australia.
—— trapezina. New Holland.
—— rufa. America.
—— margaritacea. South America.
—— gibbosa. Hab. unknown.
—— elliptica. Hab. unknown.
—— angulata. Tagus. (Gryphæa.)
—— echinata. Philippines; Amboyna.
—— stellata. Guinea.
—— prismatica. Guacomayo, Central America.
—— lamellosa. Mediterranean.
—— uncinata. Greece; Smyrna.
—— raricosta. Hab. unknown.
—— senegalensis. Senegal.

Ostrea orientalis. East Indies.
—— rosacea. China; Senegal.
—— Chemnitzii. China.
—— columbiensis. West Columbia.
—— lacerans. Senegal.
—— bicolor. Senegal.
—— multistriata. On ships' bottoms, from Africa.
—— callichroa. China.
—— glaucina. Hab. unknown.
—— sinensis. China.
—— turbinata. Indian Ocean.
—— crista galli. Indian Ocean.
—— hyotis. Indian Seas.
—— radiata. Indian Ocean.
—— megadon. Peru.
—— pes tigris. Java.
—— Lincolnii. Australia.
—— pyxidata. Philippines.

Mr. Woodward, in his 'Manual of Mollusca,' gives the number of recent species as 60, and of fossil as 200, and mentions the following subgenera: *Gryphæa*, Lamarck; *Exogyra*, Sowerby. Some of the species are said to be poisonous. The Rock Oyster, *Anomia*, is not bad eating. I was particularly struck with the size of those I found in Glengariff Bay, on the west of Ireland.

I believe that Delle Chiaje is right, when he says that the Mussel and Oyster are poisonous in summer; and probably this is the case more or less with all shell-fish that have spawned, or are just about to spawn, and that those which, when out of season, are

sold in the London market, are not fit for food. I have seen the effects of eating out of season mussels, which cause great derangement in the system; but I have not seen any one made ill by oysters, although the same effects might be expected, and occurred at Havre. The 'Green Oyster,' formerly in such high repute, is now gone out of fashion, and those with white beards are esteemed the most. The green colour at Burnham, Mr. Sweeting informs me, is imparted by a species of weed, growing on the beds; this is probably not unwholesome: but there is another green oyster, found on some portions of the Welsh coast, which I should most decidedly think was; it is said to be coloured with copper from the mines.

CHAPTER V.

ENEMIES OF THE OYSTER.

Oysters have many enemies under water as well as above. The *Purpura lapillus*, on some beds, is very destructive, and has at Burnham the local name of 'Whelk-tingle.' By means of an apparatus attached to its tongue, and armed with small siliceous spicula at the point, it gradually bores a hole through the shell, and sucks out the inhabitant. This animal exudes, when irritated, a purple dye, which was in such great repute among the Romans, that none but those of the highest rank were allowed to wear it; it was called by the ancients the Tyrian dye. The star-fish are enemies to the oyster, and are generally destroyed by the fishermen when taken on the beds.

A boring sponge (*Cliona*) completely riddles the shells of oysters, particularly the large and deep-sea varieties. Numbers of dead shells may occasionally be picked up on the beach, bored by it. A species of Annelid, called *Hermella*, which forms tubes of sand and comminuted shells, completely smothers the oysters in some localities, agglutinating them into one mass.

The common Barnacle, called 'Nuns,' is also much detested by the fishermen, as, by attaching itself to the outside of the shell, it destroys its smooth appearance, so much prized by the proprietors of native oysters and their customers. There are others, and their name is Legion, that feed upon the young fish. The common Mussel, when it establishes a colony upon an oyster-bed, does much harm indirectly; not so much by adhering to the shells, as by the mud collecting about them forming an uneven bottom. The Nullipore, called by the fishermen 'Coral,' is also very injurious to the beds off some parts of the Isle of Man.

CHAPTER VI.

LIST, AND ACCOUNT, OF THE PRINCIPAL OYSTER BEDS.

On the shores of England the principal nurseries of oysters, not only for the English markets, but also for the foreign, are those on the coast of Essex and the estuaries adjoining: those taken there are called 'Natives.' Mr. Sweeting claims the name as peculiarly applicable to his fishery, as within his memory no strange oysters have ever been introduced. Good oysters are also found at Whitstable, Colchester, Rochester, Milton, Faversham, Queenborough, Malden, Bricklesea, Strood, and probably some other places. Those of Whitstable differ from those of the other localities, the water being deeper: it is stated that they are earlier in season. The western coast of England is not remarkable for any great oyster-fishery, that I am aware of.

The Jersey beds also supply immense numbers of oysters to the English market, and also those of Guernsey and Sark. The beds, as known at the time, are marked in the Government chart attached to the Convention with France; but there have been

others discovered since. If a fisherman happen to meet with a bed that has not been found before, he generally keeps it a secret as long as he can; but, when others find it out, the bed is so overworked, that it is quite or nearly ruined for many years, which probably is one of the causes of the decrease in the supply.

Ireland is also very fruitful in oysters, beds being scattered nearly all round the coast: the principal are, Clew Bay, Mayo; Ballisodare, Sligo; Westport, Mayo; Mulroy, Donegal; Carlingford, Louth; Killery, Mayo; Ballyconeely, Galway; Kenmare River, Kerry; Blackrod Bay, Mayo; Arklow, Wicklow; Carrickfergus in Belfast Lough; Malahide and Poolbay, near Dublin; Red-bank beds and Lessadil, Clare; and Ardbeur Bay, Galway. The public banks, however, I am informed, are nearly exhausted from overdredging.

Scotland also possesses many beds, as Loch Ryan, a chartered loch, the property of Colonel Wallace, from whom Hugh Kear rents the Scar bank. There are a few oysters in Loch Fyne, but they are very scarce, and of the large sort.

The Frith of Forth beds are very extensive, and yield large numbers. Natural beds also occur in many localities among the adjacent islands.

Several beds of small extent occur round the Isle of Man; one extends from near Douglas Lighthouse

to Laxey; another is found in Ramsey Bay, also famous for scollops. A few oysters are also found off Ballaugh.

Most of these beds have nullipore on them, which is very injurious.

The chief beds of North Wales are those of Bardsey, Porth Dyllaen, Rhoscolyn, the Menai Straits, and Beaumaris; on the latter of which great numbers of oysters, brought from Ireland, are laid down, to be ready for the Liverpool market. Caernarvon Bay contains numerous beds, as those of Llandwyn. There are also beds in the Tudwal roads off Pwyl-helli: many of them owe their preservation to the nature of the coast,—the fishing not being allowed in the summer, and in winter the westerly gales prevailing, and no safe harbour to run to. Except in September, there is not much fishing going on.

In South Wales there are many beds. Milford furnishes a good supply.

It is almost impossible to arrive at an exact estimate of the annual supply of oysters; but probably the following is an approximation *, as far as it goes :—

London	130,000 bushels.	Mr. Wickenden.
Channel Islands ..	8,000,000 tubs.	Dr. Knap.
Newhaven	1,013,760 oysters.	D. Moffat.
Preston Pans	1,013,760 oysters.	D. Moffat.

Shannon beds yield a revenue of 1400*l.* per annum.

* See Professor Forbes's work, 'The History of the British Mollusca.'

CHAPTER VII.

SUGGESTIONS FOR THE FORMATION OF NEW OYSTER-BEDS AND THE PRESERVATION OF OLD ONES.

The conditions which appear to be necessary for the establishment of new oyster-beds, or of feeding-beds, according to my observations, are the following:—

That the bottom should be tolerably level and hard, either composed of fine gravel or old shells on the surface,—the depth not more than 15 fathoms for first-class oysters.

That no dredging should be allowed during the spawning season, or until the middle of August, and then only to remove the sizeable oysters to feeding-beds, and from thence to market about the 15th of September. If there is a run of fresh water near the bed, or over it, all the better. In making a new bed, if possible, good cultch should be obtained from a bed of repute in the first instance, to stock it: this is preferable to old oysters, as they do not spawn well after moving, and do not attach themselves.

To renovate the old beds that are nearly exhausted, rest would of course be the most certain method, if

only for one year; or if there are many of the large sort of oyster, let them be taken up in October, when all spawning is over.

That fence months, from the middle of April to the middle of September, be strictly enforced; any oysters exposed for sale, or taken during those months, should be confiscated, and a fine imposed upon the person in whose custody they are found, whether the sales take place inland or on the coast; and that no difference be made between British oysters and those coming from abroad.

That a license should be granted for the removal of cultch and spat, the quantity being stated, to stock other beds, by some one in authority, the locality to which it is to be removed being also registered; that these conditions being complied with, the person establishing such new beds should have granted to himself and his successors the sole right of fishing during the proper times, and that penalties should be fixed for transgressing this regulation.

For feeding-beds the same conditions would apply as to permanent beds, except that the water may be much shallower, just deep enough to prevent frost killing the oysters at low water. Tanks might be established similar to those at Burnham and elsewhere, which would fill at high water, and having a sluice attached for the purpose of keeping them full, or letting off the water: the oysters in these should

be those fit to send to market, removed into them from the feeding-beds.

My reasons for lengthening the fence time are that it would suit all fisheries round the coast; prevent the spat being injured so much by the dredge, as the shell would have become harder in the additional fortnight; and the fish, just filling for spawning in April, would not be disturbed and expel their spawn before it is ripe.

I am aware that a question will arise, viz. what are the fishermen to do during the fence months for employment? Some are necessary as watchers to keep off trespassers; the feeding-beds would have to be levelled and prepared with gravel or old shells to give them a proper surface; boats' rigging and fishing tackle to be made new, or repaired. In many localities, trawling, line-fishing, and herring-fishing might be carried on, and in others salmon might be caught; some might be also employed in conveying the fish to market, in cultivating their gardens, in dredging shell-sand and collecting sea-weed for agricultural purposes; others in improving the harbours, for which Government ought to find the whole of the necessary funds, or, at all events, a portion; and in erecting and improving convenient buildings for salting: so that altogether I think there need be no lack of employment; and I am quite sure

that any loss at first, when the whole system had got into working, would be amply repaid.

I was for some time of opinion that oysters differed in their times of spawning in deep and shallow water, and am still so; but the data I at present possess are so meagre, that I cannot confidently assert that the difference is very great. Of one fact I am, however, pretty certain,—that they do not spawn so freely; and in water over 20 fathoms, I believe, not at all.

There is one point which ought invariably to be imposed on beds which are reduced to proper working order:—a chain-dredge should never be used where it can possibly be avoided until after Christmas in each year, hides and nets being substituted. There are, however, some beds on which the chain-dredge is indispensable, where the stones are sharp and angular.

APPENDIX.

SINCE the whole of the foregoing portion of this little work was written, I have had my attention called to the Report of Mons. Coste to the Emperor of the French, headed "L'Empereur a reçu de M. Coste, Membre de l'Institut, Professeur d'Embryogénie comparée au Collège de France, le rapport suivant," and published in the *Moniteur* of the 18th of June 1858.

Mons. Coste does not differ materially, in the mode he recommends for the renovation of the old beds and reproduction of new ones, from my short suggestions given in the last chapter of this work. This coincidence shows that the same remedies to preserve the old beds of oysters, and produce new ones, are judged applicable to both sides of the Channel and to the neutral ground, and that by an amicable arrangement a much larger supply might be furnished to the markets of both England and France. I subjoin, for the information of those who may not have seen the Report of Mons. Coste, a few extracts from his recommendations, merely mentioning that Mons. Coste and myself were both in ignorance of what the other intended to propose, or even that either intended to propose anything, until within the last four days (July 21) I had a copy of the Report of Mons. Coste placed in my hands. Mons. Coste, after enumerating the bad state of the French beds, writes:—"To this deplorable state of matters there is one remedy, of easy application, of

certain success, and which will give an incalculable supply to public nourishment: this remedy consists in undertaking, at the expense of the State, under the care of the Marine Administration, and by means of its vessels, the sowing (with oysters) of the shores of France, so as to restock its ruined beds, to revive those which are extinguished, to extend those which prosper, to create new ones wherever the nature of the bottom will permit their establishment; and when, through this generous commencement, the productive beds shall have sufficiently developed themselves in all places, they might then be submitted to a salutary system of regulated gatherings, allowing some to remain quiet while others are worked,—an arrangement which for a century has preserved the beds of Cancale and Granville from destruction." Mons. Coste then proposes that oysters should be dredged on common ground, and laid down in the bay of St. Brieux, the bottom being previously cleared; and goes on to say, "that by aid of these very simple means, from the bay of St. Brieux alone, at an insignificant expense, may be made a considerable revenue, provided all the necessary means are taken for the success of the enterprise."

"Among the precautions I place in the first rank that of not allowing the productive shell-fish to remain out of the water longer than the time necessary for their transport from the place of their fishing to that of their destination, or their provisional resting-place. It is through having neglected to conform to this rule, that previous attempts have failed; but every time it has been observed, the experiment has succeeded, as is proved by the trials of Mons. De Bon in the Rance."

Mons. Coste proposes to lay down hurdles twisted with branches with their bark on for the spat to attach itself to, so as to prevent its being drifted away by the currents;

and when the spat is sufficiently large, to remove them for the stocking of new beds,—a suggestion, which I should think would certainly answer, if too much weed did not get entangled in them, the spat attach itself to the half-decayed weeds instead of to the wood, and they did not smother the old oysters which happen to be under them. This, however, I think, like other points, is a matter for experiment. Hampers or baskets made similarly to lobster-pots, only without bottoms, and moored in a similar manner, might answer better, would not destroy the oysters underneath, and could be more easily moved. I believe also that sheets of galvanized iron, bent into the form of a low arch, merely touching at the two ends, and sunk with a galvanized wire and a piece of wood attached to find them again, would answer the purpose. Copper-wire must not be used, or galvanic action will take place. On beds, however, where mud and sand are liable to collect, I should be very cautious in sinking anything, as a mud-bank is soon made, and not so easily got rid of. There is no doubt, however, that any mode that will collect the spat, which would otherwise be destroyed by being washed away with the mud and silt, or deposited on unsuitable ground, would be most desirable, and a great saving of fish.

Mons. Coste's plan of dividing the beds into zones, and only returning to them every two or three years, would be in many places absolute ruin to the beds, unless the oysters were cleaned and redeposited: they would, in fact, very soon take the form of natural beds which had not been worked; the oysters would become coarse, covered with barnacles and other parasites, and adhere together; and the beds would, in fact, have to be rebroken up.

The police regulations proposed by Mons. Coste are very good, except that I think the present fence-month, as I have proposed, would be better extended; and I do not consider

that it is necessary for the police to examine the beds so minutely as is recommended. There is no doubt, that if the fisheries were altogether shut, as recommended by Mons. Coste, until February, the quantity of spat destroyed would be less; but if the bottom of the bed be composed of old shells and gravel, the number of spat on the former will be found many times to outnumber those on the live shells. It would, I believe, answer to collect old shells from the fishmongers, after the fish had been extracted, for the purpose of returning them to the beds, to make a foundation both for old and young oysters to rest upon. This proposal would so much reduce the time for oyster-fishing beyond that which is in use at present, that there would be only three months left for fishing, so that it would scarcely be worth while for persons to follow the oyster-trade at all, although the produce might be the same, or even greater, which it probably would be, than at present. This proposal of Mons. Coste would also have a very great effect upon the market, by forcing into it the same quantity during three months that previously supplied it for eight;—thus inevitably lowering the price, to the loss of the fishermen and proprietors. Mons. Coste indeed states that the oysters for market ought to remain on the feeding-grounds before they are fit for market; but if they are dredged previously to February, to supply the feeding-grounds, I cannot think that much advantage will accrue.

FINIS.

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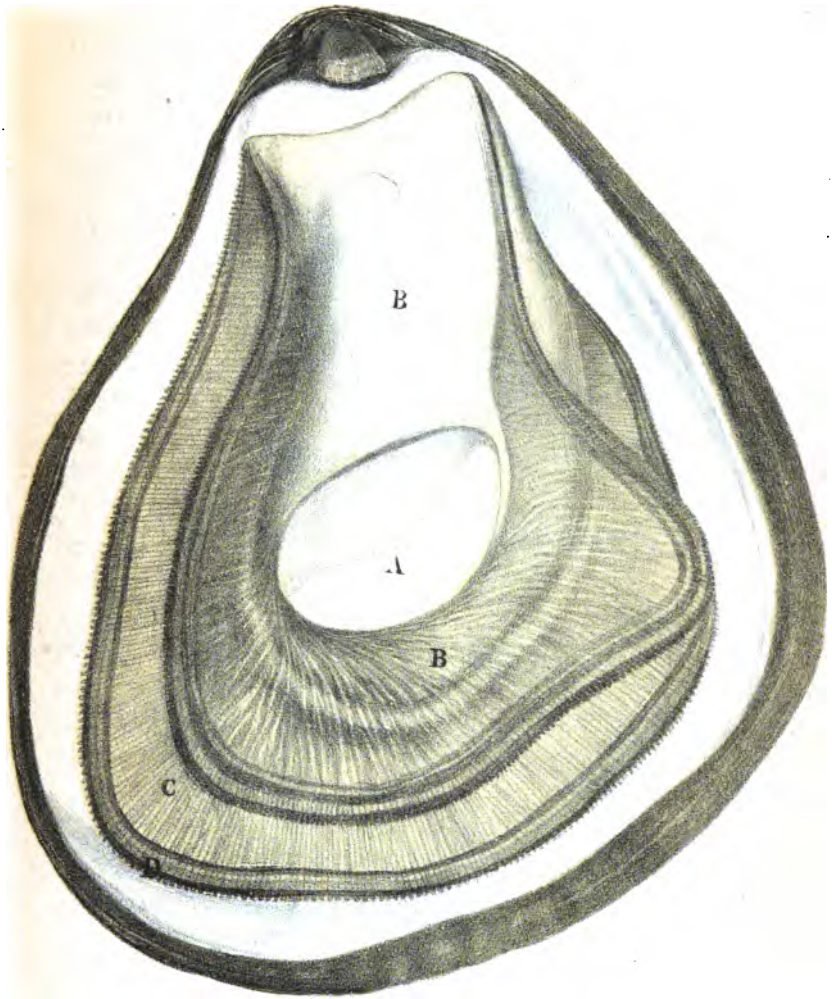

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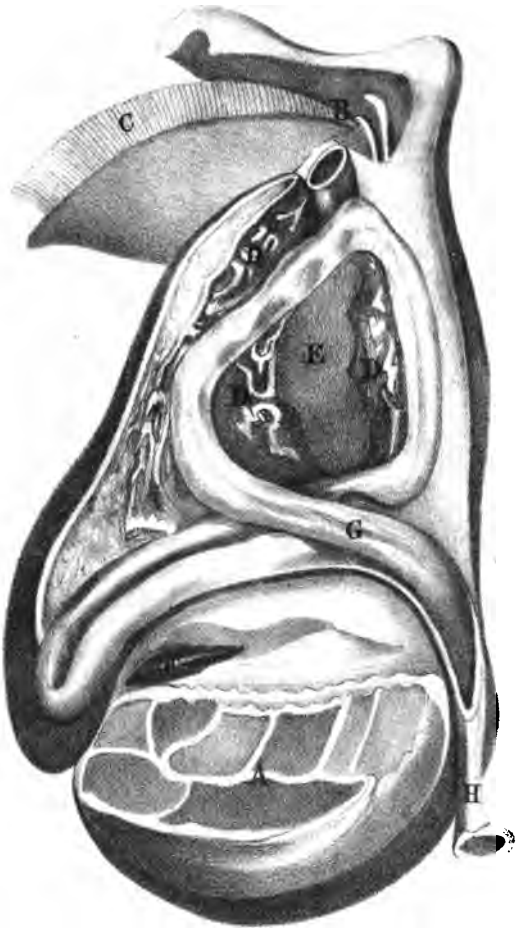

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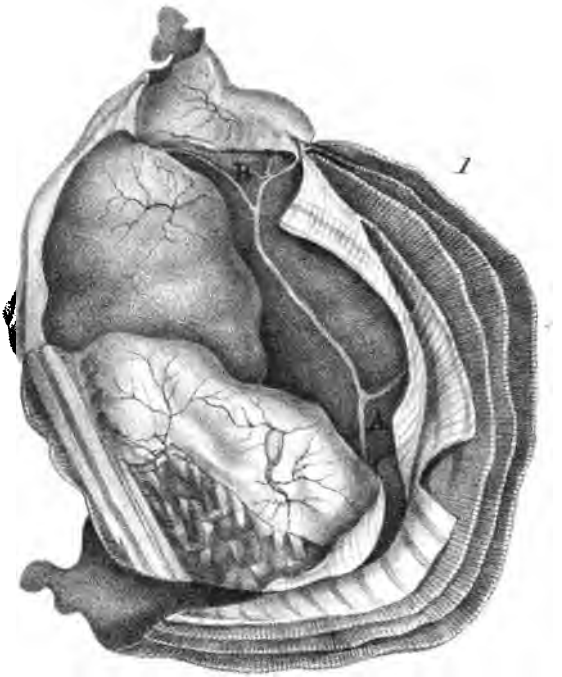

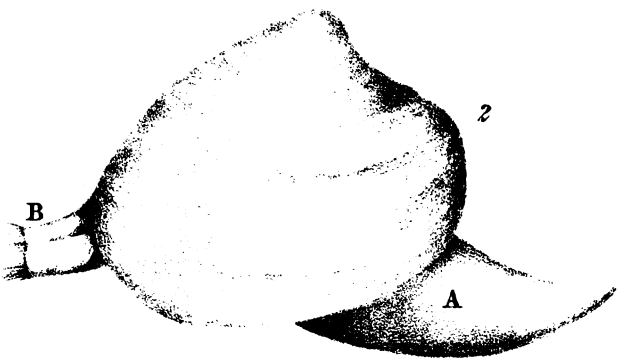

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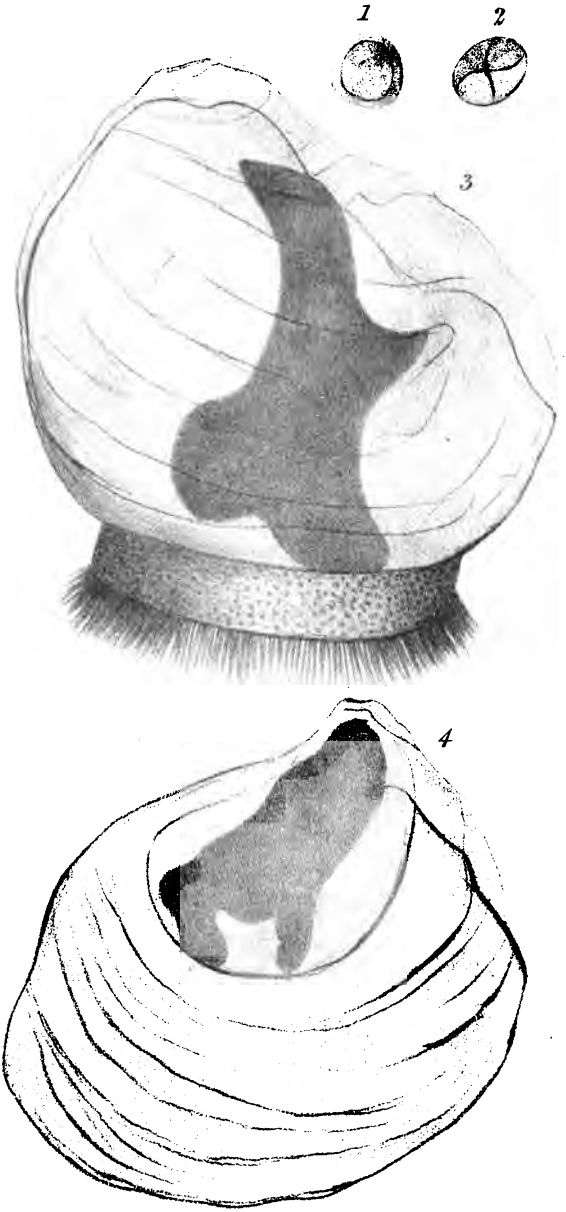

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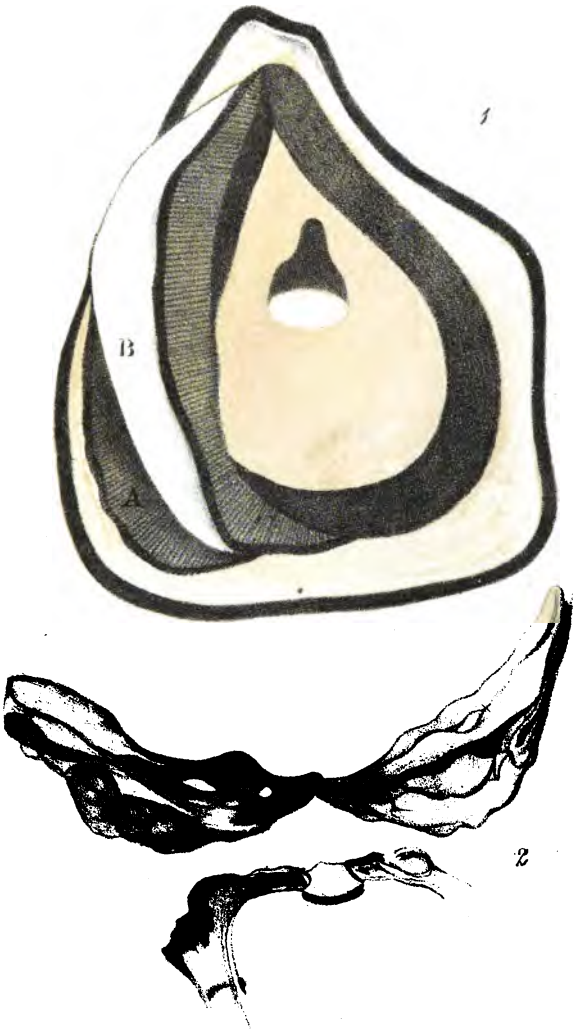
PLATE 5.



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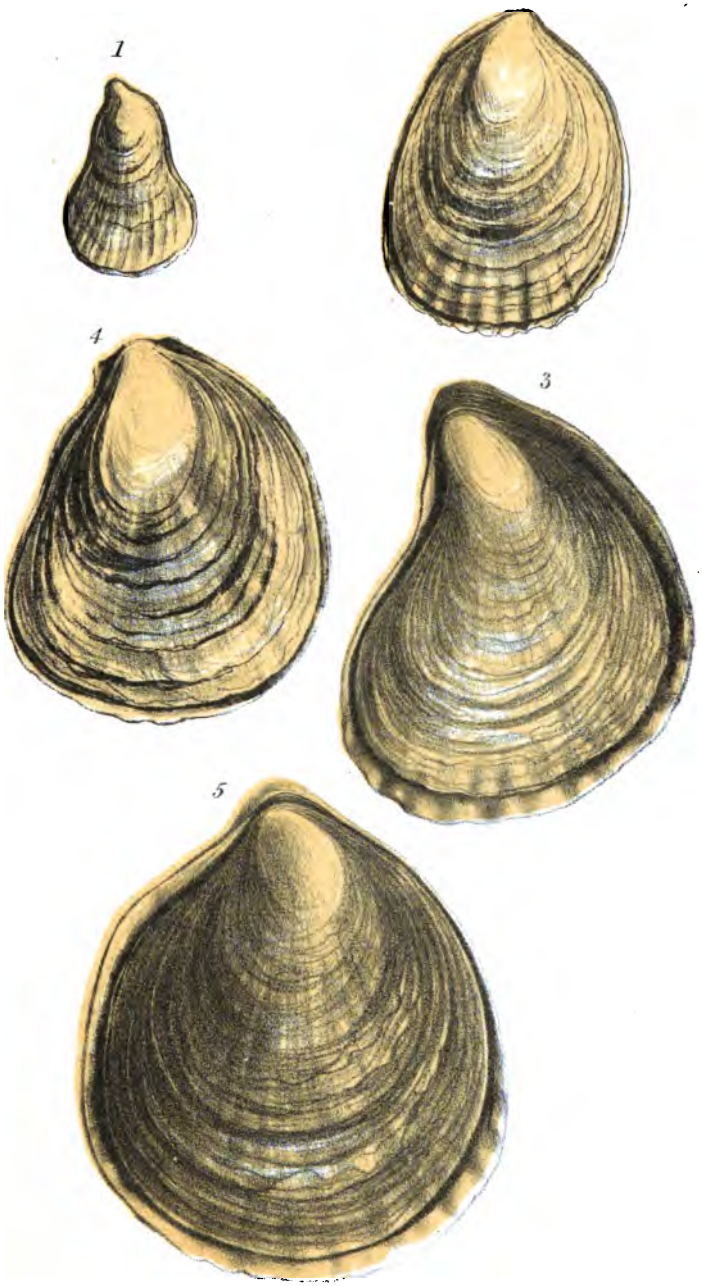

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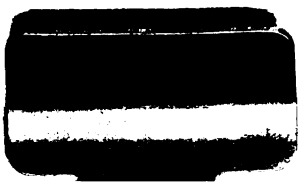
INDEX.

	Page
Adams & Baikie's Manual of Nat. Hist.	10
Adams's Genera of Mollusca	4
Aikin's Arts and Manufactures	12
Anatomical Manipulation	9
Ansted's Ancient World	7
—— Elementary Course of Geology	7
—— Geologist's Text-Book	7
—— Gold-Seeker's Manual	7
—— Scenery, Science, and Art	12
Babington's Manual of British Botany	5
Baptismal Fonts	13
Beale on Sperm Whale	1
Bell's British Quadrupeds	1
—— British Reptiles	2
—— British Stalk-eyed Crustacea	4
Bloomfield's Farmer's Boy	14
Boccius on Production of Fish	2
Bonaparte's List of Birds	2
Brightwell's Life of Linnæus	12
Burton's Falconry on the Indus	1
Clark's Testaceous Mollusca	3
Cocks's Sea-Weed Collector's Guide	6
Couch's Illustrations of Instinct	10
Cumming's Isle of Man	11
Currency	14
Dallas's Elements of Entomology	4
Dalyell's Powers of the Creator	10
—— Rare Animals of Scotland	10
Dawson's Geodephaga Britannica	5
Domestic Scenes in Greenland & Iceland	12
Douglas's World of Insects	4
Dowden's Walks after Wild Flowers	7
Drew's Practical Meteorology	9
Drummond's First Steps to Anatomy	7
Economy of Human Life	14
Elements of Practical Knowledge	12
England before the Norman Conquest	12
Entomologist's Annual	4
—— Companion	5
Evening Thoughts	12
Every-day Wonders	12
Fly Fishing in Salt and Fresh Water	3
Forbes's British Star-fishes	3
—— Malacologia Monensis	3
—— and Hanley's British Mollusca	3
—— and Spratt's Travels in Lycia	11
Garner's Nat. Hist. of Staffordshire	11
Gosse's Aquarium	11
—— Birds of Jamaica	2
—— Canadian Naturalist	11
—— Handbook to Marine Aquarium	11
—— Manual of Marine Zoology	11
—— Naturalist's Rambles on Dev. Coast	11
—— Omphalos	8
—— Tenby	11
Gray's Bard and Elegy	14
Greg and Lettsom's British Mineralogy	8
Griffith & Henfrey's Micrographic Dict.	9
Harvey's British Marine Algæ	6
—— Nereis Boreali-Americana	6
—— Sea-side Book	11
Henfrey's Botanical Diagrams	6
—— Elementary Course of Botany	5
—— Rudiments of Botany	6
—— Translation of Mohl	5
—— Vegetation of Europe	5
—— & Griffith's Micrographic Dict.	9
Hewitson's Birds' Eggs	1
—— Exotic Butterflies	5
Ibbetson's Geology of Isle of Wight	12

	Page
Instrumenta Ecclesiastica	13
Jenyns's Observations in Meteorology	9
—— Observations in Nat. History	9
Jesse's Angler's Rambles	3
Johnston's British Zoophytes	4
—— Introduction to Conchology	3
—— Terra Lindisfarnensis	6
Jones's Aquarian Naturalist	8
—— Animal Kingdom	9
—— Natural History of Animals	9
Knox's (A. E.) Rambles in Sussex	1
Knox (Dr.), Great Artists & Great Anat.	9
Latham's Descriptive Ethnology	10
—— Ethnology of British Colonies	10
—— Ethnology of British Islands	10
—— Ethnology of Europe	10
—— Man and his Migrations	10
—— Varieties of Man	10
Leach's Synopsis of British Mollusca	3
Letters of Rusticus	10
Lowe's Faunæ et Floræ Maderæ	6
—— Manual Flora of Madeira	6
Malan's Catalogue of Eggs	1
Martin's Cat. of Privately Printed Books.	14
Memoirs of Hugh E. Strickland	8
Micrographic Dictionary	9
Mohl on the Vegetable Cell	5
Moule's Heraldry of Fish	2
Newman's British Ferns	7
—— History of Insects	4
—— Letters of Rusticus	10
Northcote & Church's Chem. Analysis	7
Owen's British Fossil Mammals	8
—— on Skeleton of Extinct Sloth	8
Paley's Gothic Moldings	14
—— Manual of Gothic Architecture	13
Poor Artist	12
Prescott on Tobacco	12
Prestwich's Geological Inquiry	8
—— Ground beneath us	7
Samuelson's Humble Creatures	8
Sclater's Tanagers	1
Selby's British Forest Trees	6
Shakspeare's Seven Ages of Man	13
Sharpe's Decorated Windows	13
Shield's Hints on Moths and Butterflies	4
Siebold on True Parthenogenesis	4
Smith's British Diatomaceæ	7
Sowerby's Thesaurus Conchyliorum	3
Spratt's (and Forbes's) Travels in Lycia	11
Stainton's Butterflies and Moths	5
—— History of the Tineina	5
Strickland's Ornithological Synonyms	2
—— and Melville on the Dodo	2
Sunday-Book for the Young	12
Tugwell's Sea-Anemones	4
Vicar of Wakefield, Illustr. by Mulready	14
Watts's Songs, Illustrated by Cope	14
Ward (Dr.) on Healthy Respiration	11
Ward (N. B.) on the Growth of Plants	6
White's Selborne	11
Wilkinson's Weeds and Wild Flowers	5
Williams's Chemical Manipulation	7
Wollaston's Insecta Maderensia	5
—— on Variation of Species	10
Woodward on Polarized Light	9
Yarrell's British Birds	1
—— British Fishes	2
—— on the Salmon	2

7 3

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